Complete Summary

GUIDELINE TITLE

Physical activity and exercise recommendations for stroke survivors.

BIBLIOGRAPHIC SOURCE(S)

Gordon NF, Gulanick M, Costa F, Fletcher G, Franklin BA, Roth EJ, Shephard T. Physical activity and exercise recommendations for stroke survivors: an American Heart Association scientific statement from the Council on Clinical Cardiology, Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention [trunc]. Circulation 2004 Apr 27;109(16):2031-41. [96 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Stroke

GUIDELINE CATEGORY

Management
Prevention

CLINICAL SPECIALTY

Cardiology
Family Practice
Neurology

Physical Medicine and Rehabilitation
Preventive Medicine

INTENDED USERS

Nurses
Physical Therapists
Physicians

GUIDELINE OBJECTIVE(S)

- To help bridge the current knowledge gap since most healthcare providers have limited experience and guidance in exercise programming for stroke survivors
- To prevent complications of prolonged inactivity in stroke survivors
- To decrease the incidence of recurrent stroke and cardiovascular events
- To increase aerobic fitness in stroke survivors

TARGET POPULATION

Stroke survivors

INTERVENTIONS AND PRACTICES CONSIDERED

1. Pre-exercise evaluation
2. Exercise programming
    - Aerobic training
    - Strength training
    - Flexibility training
    - Neuromuscular (coordination and balance) training
3. Identification of physical, mental, and psychological barriers to physical activity

MAJOR OUTCOMES CONSIDERED

- Peak heart rate
- Percent of age-predicted maximum heart rate
- Peak metabolic equivalent test (MET)
- Blood pressure
- Exercise tolerance
- Peak oxygen consumption
- Ability to perform activities of daily life (ADL)
- Range of motion

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on January 30, 2004. It was published in Circulation 2004; 109: 2031-2041 and was co-published in the May 2004 issue of Stroke.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The Pre-exercise Evaluation

Exercise is a normal human function that can be undertaken with a high level of safety by most people, including stroke survivors. However, exercise is not without risks, and the recommendation that stroke survivors participate in an exercise program is based on the premise that the benefits outweigh these risks. Therefore, the foremost priority in formulating the exercise prescription is to minimize the potential adverse effects of exercise via appropriate screening, program design, monitoring, and patient education.

As is the case for the general population, the major potential health hazards of exercise for stroke survivors are likely to include musculoskeletal injury and sudden cardiac death. Depending on the severity of disability and other coexisting medical conditions, certain patients may need to participate in a medically supervised exercise program. However, before embarking on a physical conditioning regimen, it is recommended that all stroke survivors undergo a complete medical history, usually the most important part of the pre-exercise evaluation, and a physical examination aimed at the identification of neurological complications and other medical conditions that require special consideration or constitute a contraindication to exercise.

From a pre-exercise evaluation perspective, the most serious complication of exercise participation, although rare, is sudden cardiac death. Although habitual physical activity is associated with an overall reduction in the risk of sudden cardiac death in the general adult population and the likelihood of experiencing a fatal cardiac event during exercise training is extremely small, it is well established that exercise can precipitate malignant ventricular arrhythmias. Moreover, several studies have now shown that the transiently increased risk of cardiac arrest that occurs during exercise results primarily from the presence of preexisting coronary artery disease (CAD), especially in habitually sedentary adults. Because up to 75% of stroke victims have coexisting cardiac disease, and 20% to 40% of asymptomatic stroke patients may have abnormal tests for silent cardiac ischemia, it is recommended that stroke patients undergo graded exercise testing with electrocardiograph (ECG) monitoring as part of a medical evaluation before beginning an exercise program.

As discussed in another American Heart Association/American Stroke Association scientific statement, there are limited data on the safety of graded exercise testing after a stroke. Available data suggest that graded exercise testing is likely to be associated with an acceptably low risk of serious cardiovascular complications in stroke patients.

Generally, graded exercise testing in stroke patients should be conducted in accordance with contemporary guidelines as detailed elsewhere. Briefly, the exercise test modality/protocol for the stroke survivor is selected to optimally assess functional capacity and the cardiovascular response to exercise. The test should evaluate the heart rate, rhythm, and ECG response to exercise as well as

the systolic and diastolic blood pressure response. Careful assessment of the subjective response (especially cardiac symptoms) should be done. The testing mode should be selected or adapted to the needs of the stroke survivor. Often, a standard treadmill walking protocol can be used (with the aid of handrails). The Bruce protocol (or a modified version) is appropriate for many subjects, with a progressive workload achieved by increasing speed and grade of the treadmill. For some subjects, however, other modes are needed, and special protocols are available for stroke survivors, especially those with hemiplegia or paresis. Many testing protocols use arm cycle ergometry with the subject seated to optimize the load. Other protocols use arm-leg or leg cycle ergometry.

Thus, if flexibility and adaptability are used in the selection of testing protocols, most stroke survivors who are deemed stable for physical activity can undergo exercise testing. Such testing helps determine the subject´s exercise capacity and identify associated adverse signs or symptoms that may affect the safety of an exercise program. For patients with disabilities that preclude exercise testing, pharmacological stress testing should be considered.

No studies have specifically addressed the issue of how soon after a stroke graded exercise testing can be performed safely. Until such data become available, good clinical judgment should be foremost in deciding the timing of graded exercise testing after stroke and whether to use a submaximal or symptom-limited maximal test protocol. In the absence of definitive evidence, it may be prudent to follow guidelines similar to those recommended for post–myocardial infarction patients and use submaximal protocols (with a predetermined end point, often defined as a peak heart rate of 120 beats per minute (bpm), or 70% of the age-predicted maximum heart rate, or a peak metabolic equivalent [MET] level of 5) if graded exercise testing is performed during the first 14 to 21 days after stroke. In the absence of definitive evidence, it also appears prudent to consider a systolic blood pressure >250 mm Hg and/or diastolic blood pressure >115 mm Hg an absolute (rather than relative) indication to terminate a graded exercise test in a stroke patient. As is recommended for patients with CAD, the upper limit of the target heart rate range for subsequent exercise training should generally be at least 10 bpm below the heart rate associated with blood pressure responses of this magnitude.

From a practical standpoint, it may not be possible, for a variety of reasons, for many stroke patients to perform an exercise test before they begin an exercise program. For patients for whom an exercise ECG is recommended but not performed, lighter-intensity exercise should be prescribed. The reduced exercise intensity may be compensated for by increasing the training frequency, duration, or both.

In summary, evaluation of the stroke survivor for an exercise program is multidimensional and includes a careful medical history and physical examination. Specific attention should focus on the results of an exercise test, if available. If the evaluation is conducted with the aforementioned considerations, an exercise program can be highly beneficial and safe for the stroke survivor.

Recommendations for Exercise Programming

Exercise programming recommendations for stroke survivors are summarized in the table below entitled "Summary of Exercise Programming Recommendations for Stroke Survivors." Prescribing exercise for the stroke patient is comparable in many ways to prescribing medications; that is, one recommends an optimal dosage according to individual needs and limitations. Aerobic training modes may include leg, arm, or combined arm-leg ergometry at 40% to 70% of peak oxygen consumption or heart rate reserve, with perceived exertion used as an adjunctive intensity modulator. The recommended frequency of training is 3 to 7 days a week, with a duration of 20 to 60 min/d of continuous or accumulated exercise (e.g., •10-minute bouts), depending on the patient´s level of fitness. Intermittent training protocols may be needed during the initial weeks of rehabilitation because of the extremely deconditioned level of many convalescing stroke patients.

Table: Summary of Exercise Programming Recommendations for Stroke Survivors*

Mode of Exercise	Major Goals	Intensity/Frequency/Duration**
Aerobic: Large-muscle activities (e.g., walking, treadmill, stationary cycle, combined arm-leg ergometry, arm ergometry, seated stepper)	• Increase independence in activities of daily living (ADLs) • Increase walking speed/efficiency • Improve tolerance for prolonged physical activity • Reduce risk of cardiovascular disease	• 40%-70% peak oxygen uptake; 40%-70% heart rate reserve; 50%-80% maximal heart rate; rating of perceived exertion (RPE) 11-14 (6-20 scale) • 3-7 days/week • 20-60 min/session (or multiple 10-min sessions)
Strength: • Circuit training • Weight machines • Free weights • Isometric exercise	• Increase independence in ADLs	• 1-3 sets of 10-15 repetitions of 8-10 exercises involving the major muscle groups • 2-3 days/week

Mode of Exercise	Major Goals	Intensity/Frequency/Duration**
Flexibility: Stretching	• Increase range of motion (ROM) of involved extremities • Prevent contractures	• 2-3 days/week (before or after aerobic or strength training) • Hold each stretch for 10-30 seconds
Neuromuscular: Coordination and balance activities	• Improve level of safety during ADLs	• 2-3 days/week (consider performing on same day as strength activities)

Notes

* Summary of exercise programming recommendations for stroke survivors (American College of Sports Medicine, 2000; Fletcher et al., 2001; Palmer-McLean & Harbst, 2003; Pollock et al, 2000; Gordon, 2003; American College of Sports Medicine, 1998; American Association of Cardiovascular and Pulmonary Rehabilitation, 2004).

** Recommended intensity, frequency, and duration of exercise depend on each individual patient´s level of fitness. Intermittent training sessions may be indicated during the initial weeks of rehabilitation.

Treadmill training appears to offer 3 distinct advantages in the exercise rehabilitation of persons who have had a stroke. First, it requires the performance of a task required for everyday living, namely, walking, which should enhance the generalizability of training effects. Second, the use of handrail support and "unweighting" devices (i.e., harnesses that serve to "lift" patients, effectively decreasing their weight) allows patients to walk on a treadmill who might otherwise be unable to exercise. Third, in patients with residual gait deviations, exercise intensity can be augmented by increasing the treadmill grade while maintaining a comfortable speed.

To maximize the generalizability of the conditioning response to daily activities, adjunctive upper-body and resistance-training programs are also recommended for clinically stable stroke patients. In one study, 6 weeks of bilateral arm training with rhythmic auditory cueing improved several key measures of sensorimotor impairments, functional ability (performance time), and functional use in patients with chronic upper-extremity hemiparesis. Although there are no accepted guidelines for determining when and how to initiate resistance training after ischemic or hemorrhagic stroke, it may be prudent to prescribe 10 to 15 repetitions (i.e., higher repetitions with reduced loads) for each set of exercises rather than 8 to 12 repetitions, similar to that recommended for post–myocardial infarction patients. Such regimens should be performed 2 to 3 days per week and

include a minimum of 1 set of at least 8 to 10 exercises that involve the major muscle groups (arms, shoulders, chest, abdomen, back, hips, and legs). Some studies suggest that such regimens may promote gains in strength and gait velocity and that eccentric training may be more suitable for stroke patients than concentric training. Adjunctive flexibility and neuromuscular training to increase range of motion of the involved side, prevent contractures, and increase activities of daily living are also recommended.

Barriers to Physical Activity and Exercise Training in Stroke Patients

The evaluation of physiological and emotional barriers to post-stroke physical activity requires an evaluation of primary factors of stroke severity, comorbidities, and clinical deficits, as well as secondary factors of familial support, depression, post-stroke fatigue, social integration, and cultural issues. Professional assessment and intervention relative to primary and secondary factors are important to help prevent a cycle of diminished motivation, loss of engagement in activity, deconditioning, subsequent related acute illness (such as pneumonia), and a resultant need for temporary reinitiation of acute therapy.

As discussed previously, the initial step to implementing an effective exercise regimen for post-stroke patients is a medical history and physical examination to identify physiological barriers. The combination of comorbidities and neurological deficits that are unique to each stroke survivor requires an individual approach to ensure that the patient can safely and effectively engage in a physical activity program. The evaluation of a stroke survivor for an exercise program involves acquisition of data from both the patient and his or her caregiver.

In addition to components of the pre-exercise evaluation already outlined, the neurological examination should clarify the cognitive state, and the Folstein Mini Mental Status examination can be a useful ancillary test in this regard. The degree of communication deficit (i.e., aphasia, both expressive and receptive) will have a significant impact on the success of any rehabilitative program, and alternative methods of communication may need to be sought and practiced in preparation for ongoing therapy.

A complete understanding by the patient, family, and clinical team of mutually derived goals, current capabilities, and safety issues will help to circumvent interpersonal barriers to treatment and should be integrated into the development of a therapeutic plan. In the context of defining therapy goals for the post-stroke patient, it is essential that the family be integrated into the process as early as possible. Early involvement of the family unit has been strongly correlated with patient adherence to therapy, better understanding between patient and caregiver of achievable outcomes, and improved communication between patient and caregivers. To facilitate optimal outcomes from an exercise-based stroke rehabilitation program, an assessment of familial support should be undertaken.

With the aging of the population and the escalation of health-care costs, more of the burden of long-term care is being placed on family, friends, community, or religious congregations. Of all patients needing home care after an illness, approximately 80% receive at least part of their care from a family member. The significance of the assessment, integration, and care of the lay caregiver cannot be overemphasized. The stress of caring for the stroke patient can be

overwhelming and frightening. The fatigue and depression of the stroke patient is translated directly to caregivers and, thus, the effectiveness of a prescribed exercise program will depend on them as well. When applicable, an assessment of family functioning with a tool such as the McMaster Family Assessment Device may serve to enhance adherence and improve long-term outcomes.

A primary barrier to any type of post-stroke therapy is depression. The incidence of post-stroke depression ranges from 18% to 68%. The initial steps of designing a physical activity regimen for stroke patients should include an assessment for depression. Depression screening can be performed with 1 of 4 depression scales recommended in the Agency for Health Care Policy and Research Guidelines. These are the Beck depression inventory, the Center for Epidemiologic Studies depression scale (CES-D), the geriatric depression scale (GDS), and the Hamilton depression scale. Screening scales should be administered by a professional knowledgeable about the scale, its application, and its interpretation. If warranted, further assessment and treatment should be coordinated by a mental health professional, preferably one who has experience in geriatrics and stroke care. The proper assessment for depression will affect patient and caregiver motivation positively. When prescribed, the use of antidepressants should be evaluated regularly in an effort to prevent exacerbation of sleep disturbance or post-stroke fatigue.

Post-stroke fatigue, with or without depression, is reported to occur in 39% of patients but is relatively understudied in the stroke population. Without an assessment of fatigue symptoms, attempts at implementing a physical conditioning regimen for post-stroke patients may prove difficult and frustrating. A thorough assessment for fatigue syndromes may help the clinician differentiate between neurological and physiological fatigue. The patient should have an understanding that neurological fatigue syndromes may never be resolved completely and that long-term adaptation in activity routines may be required.

For patients who experience fatigue syndromes, an evaluation of temporality (i.e., sudden versus persistent) and intensity will assist in determining the optimal duration and intensity for exercise and physical activity. Although there are relatively few clinical trials in the treatment of post-stroke fatigue, at least 1 study has demonstrated that low-intensity aerobic exercise over a period of 6 months will improve cardiac function and reduce energy demands in patients with hemiparetic gait, thus preventing deconditioning and the associated consequences of physical inactivity.

Although certain post-stroke complications are prevented by physical conditioning, leisure-time activities may also be helpful in this regard. Such activities are part of a process of socialization. As a person grows older and experiences cognitive or physical limitations, they tend to give up these activities, which in turn may lead to social withdrawal and isolation. This tendency may be compounded in the stroke patient. Because of difficulty with mobility, perceived social stigma related to physical or cognitive deficits, or depression, many stroke patients become socially isolated. Social isolation is also strongly correlated with post-stroke depression. When family members are primary caregivers for the stroke survivor, they too may become socially isolated, which will further limit the potential venues for physical activity and exercise.

When withdrawn socially, stroke patients are not likely to venture into the neighborhood for walks, use the public swimming pool for low-impact aquatic training, or travel to a local gym for exercise classes. Studies have shown that even in stroke survivors with a significant degree of physical recovery, social isolation was still evident. Many stroke patients will not have equipment or facilities in their home to sustain interest in an exercise program in the long term. They will need to seek assistance, equipment, and facilities in the community. To enhance exercise compliance, the issue of social isolation will need to be actively addressed and resolved.

It is a standard in a caring and empathetic clinical practice to be aware of and facilitate cultural diversity. In creating and implementing any type of recovery program for the stroke survivor, it is necessary to be aware of cultural differences that may affect acceptance or adherence. It is unlikely that one specific set of recommendations could guide clinicians through the cultural diversity they are likely to experience in practice. However, the design and implementation of a physical exercise regimen should be sensitive to cultural differences in modesty, assertiveness, or expected social roles. The integration of patient and family cultural norms will help create a program that is more likely to succeed over the long term.

The complex interplay between physiological and emotional barriers to continuing recovery after a stroke demand creative and individualized rehabilitative programs to be designed and implemented by a multidisciplinary team. The relevant clinical, emotional, and social variations present in each stroke survivor preclude the application of a template to post-stroke rehabilitation. When applicable tools are used to assess the individual for physiological and emotional barriers and known and adapted techniques to remove or ameliorate such barriers are applied, each patient is best prepared to reach their optimal state of function and well-being.

Refer to the last section of the original guideline document entitled, "Importance of Comprehensive Stroke and Cardiovascular Disease Risk Reduction" for further information.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Increased knowledge of exercise programming and its benefits
- Appropriate patient guidance regarding physical activity and exercise

POTENTIAL HARMS

- As is the case for the general population, the major potential health hazards of exercise for stroke survivors are likely to include musculoskeletal injury and sudden cardiac death.
- From a pre-exercise evaluation perspective, the most serious complication of exercise participation, although rare, is sudden cardiac death. Although habitual physical activity is associated with an overall reduction in the risk of sudden cardiac death in the general adult population and the likelihood of experiencing a fatal cardiac event during exercise training is extremely small, it is well established that exercise can precipitate malignant ventricular arrhythmias.
- As discussed in another American Heart Association/American Stroke Association scientific statement, there are limited data on the safety of graded exercise testing after a stroke. Available data suggest that graded exercise testing is likely to be associated with an acceptably low risk of serious cardiovascular complications in stroke patients.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Gordon NF, Gulanick M, Costa F, Fletcher G, Franklin BA, Roth EJ, Shephard T. Physical activity and exercise recommendations for stroke survivors: an American

Heart Association scientific statement from the Council on Clinical Cardiology, Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention [trunc]. Circulation 2004 Apr 27;109(16):2031-41. [96 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2004 Apr 27

GUIDELINE DEVELOPER(S)

American Heart Association - Professional Association
American Stroke Association - Disease Specific Society

SOURCE(S) OF FUNDING

American Heart Association

GUIDELINE COMMITTEE

Council on Clinical Cardiology
(Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention)
Council on Cardiovascular Nursing
Council on Nutrition, Physical Activity, and Metabolism
Stroke Council

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American Heart Association Web site:

- HTML Format
- Portable Document Format (PDF)

Print copies: Available from the American Heart Association, Public Information, 7272 Greenville Ave, Dallas, TX 75231-4596; Phone: 800-242-8721

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

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